

Sentry: An Automated Close Approach Monitoring System for Near-Earth Objects

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In response to international concern about potential asteroid impacts on Earth, NASA's Near-Earth Object (NEO) Program Office has implemented a new system called "Sentry" to automatically update the orbits of all NEOs on a daily basis and compute Earth close approaches up to 100 years into the future. Results are published on our web site (<http://neo.jpl.nasa.gov/>) and updated orbits and ephemerides made available via the JPL Horizons ephemeris service (<http://ssd.jpl.nasa.gov/horizons.html>).

Sentry collects new and revised astrometric observations from the Minor Planet Center (MPC) via their electronic circulars (MPECs) in near real time as well as radar and optical astrometry sent directly from observers. NEO discoveries and identifications are detected in MPECs and processed appropriately. In addition to these daily updates, Sentry synchronizes with each monthly batch of MPC astrometry and automatically updates all NEO observation files. Daily and monthly processing of NEO astrometry is managed using a queuing system which allows for manual intervention of selected NEOs without interfering with the automatic system. At the heart of Sentry is a fully automatic orbit determination program which handles outlier rejection and ensures convergence in the new solution. Updated orbital elements and their covariances are published via Horizons and our NEO web site, typically within 24 hours. A new version of Horizons, in development, will allow computation of ephemeris uncertainties using covariance data. The positions of NEOs with updated orbits are numerically integrated up to 100 years into the future and each close approach to any perturbing body in our dynamic model (all planets, Moon, Ceres, Pallas, Vesta) is recorded. Significant approaches are flagged for extended analysis including Monte Carlo studies. Results, such as minimum encounter distances and future Earth impact probabilities, are published on our NEO web site.

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